NAVIGATION TERMINAL, NAVIGATION SYSTEM, PROGRAM THEREOF, AND METHOD FOR TRANSMITTING INFORMATION

5   The present disclosure relates to the subject matter contained in Japanese Patent Application No. 2002-268372 filed on September 13, 2002, which is incorporated herein by reference in its entirety.

10   BACKGROUND OF THE INVENTION

1.   Field of the Invention

The present invention relates to a navigation terminal mounted on a moving body and also relates to a navigation system including the terminal.

15 2.   Description of the Related Art

In a car navigation system mounted on a vehicle, which is a typical moving body, a map is displayed on a display section according to a current position, which has been positioned, of the vehicle, and a mark indicating the current position of the

20 vehicle is displayed on the map.

In the above car navigation system, a measurement section for positioning the current position of the vehicle includes: a GPS (Global Positioning System) receiver; and a self-contained navigation sensor for calculating the current

25 position from a running distance and a proceeding direction of

the vehicle. Map information for displaying a map on the display section, associated information associated with the map information and various functional services are provided by an information center located outside the vehicle.

5   As one of the functional services described above, the following functional service is provided. Information indicating a destination and information indicating a current position, which is a starting place, are sent from the terminal mounted on the vehicle to the information center via the

10   communication section. In the information center, a drive route is searched according to the thus received information. Drive route information indicating the thus searched drive route is sent from the information center to the terminal via the communication section. In the case of executing the above

15   route searching function service, when a user gives a direction to execute searching the route, a communication line for connecting the terminal with the information center is not necessarily established.

       For the above reasons, in some cases, there is a great

20   difference between the current position of the vehicle at the point of time when the communication line for connecting the terminal with the information center is established and the position of the vehicle inputted as a starting point when the user gave a direction so as to execute the route searching. As

25   a result, a problem may be caused in which the information

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center conducts a calculation of a route connecting a position where no vehicle actually exists with the destination.

In the case where the vehicle deviates from the route, it is necessary for the terminal to acquire a new route from the information center again. In the case where the new route to the destination is demanded according to the position of the vehicle at the point of time when the vehicle deviated from the route, a communication line to connect the terminal with the information center is not necessarily established. In this case, there is a great difference between the current position of the vehicle at the point of time when the communication line to connect the terminal with the information center is established and the position of the vehicle at the point of time when the new route is demanded. As a result, a problem may be caused in which the information center conducts a calculation of a route connecting a position where no vehicle actually exists with the destination.

SUMMARY OF THE INVENTION

In order to solve the above problems, a navigation terminal according to an embodiment of the invention includes a measurement section for measuring a current position of a movable body, a communication section for transmitting information to an information center, and a destination setting section for setting a destination. After the communication

section establishes a connection line with the information
center, the communication section transmits information
indicating the measured current position as information for
router search.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of an embodiment of the present
invention.

Fig. 2 is a flow chart showing a process of connecting a
10   line of an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, an embodiment of the present
invention will be explained below. In this embodiment shown
15   here, a navigation terminal according to the invention is
applied to a navigation system.

In Fig. 1, reference numeral 10 denotes a navigation
terminal mounted on a vehicle, which is a moving body. The
navigation terminal 10 includes a display section 11, a
20   communication section 12, a control section 13, a measurement
section 14, and an operation section 18. The control section
13 functions as a display control section for controlling the
display section 11, and also functions as a connection control
section for controlling the communication section 12.
25   Furthermore, the control section 13 functions as a

driving-guide section for performing a driving-guide on the
basis of drive route information. The measurement section 14
measures a current position of the vehicle. The operation
section 18 allows a user to input designation of a destination

5   and an execution command for a route search. Also, the
communication section 12 includes a data process section 15 for
processing transmitted/received data and a
transmission/reception section 16 for transmitting/receiving
data.

10   Reference numeral 20 shows the constitution of an
information center. The information center 20 includes a
center communication section 21, a storage section 23, and a
center control section 22. The center communication section
21 communicates with the communication section 12 mounted on

15   the vehicle. The storage section 23 stores various information
in real time such as map information, facility information,
traffic information including traffic jam information, traffic
regulation information and traffic accident information,
weather information including present weather information and

20   weather forecast in each region, and event information held at
present or in the future in each region. The center control
section 22 functions as a control section for the center
communication section, which controls communication by the
center communication section 21, and also functions as a

25   reading control section for controlling reading of the various

information from the storage section. Furthermore , the center control section 22 functions as a calculation section for calculating a drive route of the vehicle.

In the above navigation system including the navigation terminal 10 and the information center 20, various demanding commands are sent from the navigation terminal 10 to the information center 20 via a line for connecting the communication section 12 with the center communication section 21. The various information corresponding to the commands are sent from the information center 20 to the navigation terminal 10.

For the line for connecting the communication section 12 with the center communication section 21, it is possible to use the cellular phone service system and the PHS phone service system. The demanding commands sent from the navigation terminal 10 to the information center 20 include an information acquisition command and a functional command, which are provided in the conventional navigation system. The various information acquisition information includes a map demanding command for acquiring map information, a route calculation demanding command for calculating a drive route, a retrieve demanding command for retrieving a facility and a position, and an information demanding command for acquiring various information such as traffic information.

In this case, the map demanding command will be explained in detail as follows. The control section 13 outputs the current position information based on the current position measured by the measurement section 14 and also outputs the map demanding information including the map scale information to the data process section 15. In the data process section 15, the various information is converted into data in a predetermined form and then sent to the information center 20 via the sending and receiving section 16 as the map demanding command.

In the information center 20, according to the map demanding command acquired via the line for connecting the communication section 12 with the center communication section 21, the center control section 22 reads the map information from the storage section 23. This map information, which has been read, is sent to the navigation terminal 10 via the line.

In the navigation terminal 10, according to the map information acquired by the communication section 12 via the line, a map is displayed on the display section 11. In this connection, the control section 13 includes a temporary storage section 17 for temporarily storing information. The temporary storage section 17 keeps to store the various information acquired from the information center 20 including the map information unless the information is positively erased by the user.

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Next, the route calculation demanding command is described in detail below. In the navigation terminal 10, under the control of the control section 13, a plurality of images allowing the user to determine a starting place and a

5 destination are displayed on the display section 11 while the images are being successively changed over according to operation of the user.

As a result of operation on the operation section 18 performed by the user in response to the change on the display,

10 the stating place, the destination and a place to pass through are determined. Unless the user especially designates a predetermined position, the starting place is the current position of the vehicle, which has been measured by the measurement section 14 at a time of deciding. When the user

15 has decided only a destination by operation, it is judged that a route from the current position to the destination at that time is to be acquired. The control section 13 outputs the route calculation demanding command information including starting point information, destination information, passing-through

20 point information and route calculating condition information to the data process section 15 according to the information of each place. In the data process section 15, the route calculation demanding command information is converted into a predetermined form and then sent to the information center 20

25 as a route calculation demanding command.

Concerning the above destination information, a retrieve demanding command including telephone number information and postal number information for retrieving a facility and a place is sent from the navigation terminal 10 to the information

5   center 20. According to the information, the information center 20 retrieves the detailed information of the facility and the place from the storage section 23. The navigation terminal 10 acquires the retrieved detailed information and utilizes the acquired detailed information.

10   At this time, the control section 13 detects whether or not the line for connecting the communication section 12 with the center communication section 21 is established. When the line for connecting the communication section 12 with the center communication section 21 is established, the route

15   calculation demanding command is immediately sent from the navigation terminal 10 to the information center 20.

On the other hand, when the control section 13 detects that the line for connecting the communication section 12 with the center communication section 21 is not established, first, the

20   control section 13 exhibits the function of the connection control section for controlling the communication section 12 and starts the connection processing of the line to connect the communication section 12 with the center communication section 21. After that, when the connection of the line is established,

25   the information indicating the current position of the vehicle

is acquired from the measurement section 14. This information indicating the current position is used as the starting point information. The starting point information is sent together with the destination information, the passing-through point

5   information and the route calculating condition information as the route calculation demanding command information.

According to the route calculation demanding command acquired via the line connecting the communication section 12 with the center communication section 21, the information

10   center 20 calculates the most appropriate drive route from the map information, the starting point information, the destination information, the passing-through point information and the route calculating condition information, which are read by the center control section 22 from the storage

15   section 23. The drive route information according to the thus calculated drive route and the map information of the peripheral region including the route are read from the storage section 23 and sent together to the navigation terminal 10 via the line.

20   According to the drive route information acquired by the communication section 12 via the line and the map information of the peripheral region including the route, the navigation terminal 10 displays a map, on which the drive route is shown with being superimposed, on the display section 11. In this

25   connection, this drive route information and the map

information of the peripheral region including the route are stored in the temporary storage section 17 provided in the control section 13.

As another example of sending the route calculation
5   demanding command, when the vehicle actually deviates from a drive route based on the drive route information, which has already been acquired, the current position after the deviation from the drive route is used as new starting point information, and this starting point information, the destination
10 information, the passing-through point information and the route calculating condition information are automatically sent again as the route calculation demanding command.

When an obstruction to running such as a traffic jam or traffic accident is detected on the drive route, which is based
15 on the thus acquired drive route information, according to the traffic information acquired from the information center 20, a condition to exclude the road on which the obstruction to running is caused is newly added, and this route calculating condition information, the starting point information and the
20 destination information at this point of time and the passing-through point information are automatically sent again as the route calculation demanding command.

Even in the case where the route calculation demanding command is automatically sent when the vehicle deviates from
25 the drive route or when it is detected that an obstruction to

running such as a traffic jam or traffic accident is caused on the road, the control section 13 detects whether or not the line connecting the communication section 12 with the center communication section 21 is established. When the line

5   connecting the communication section 12 with the center communication section 21 has been established, the route calculation demanding command is immediately sent from the navigation terminal 10 to the information center 20.

On the other hand, when the control section 13 detects that

10 the line connecting the communication section 12 with the center communication section 21 has not been established, first, the control section 13 functions as a connection control section for controlling the communication section 12, and the connection processing of the line connecting the communication

15 section 12 with the center communication section 21 is started. When the connection of the line is established thereafter, the information indicating the current position of the vehicle is acquired from the measurement section 14 again at that time. This information indicating the current position is used as the

20 starting point information and sent as the route calculation demanding command information together with the destination information, the passing-through point information and the route calculating condition information.

Next, the information demanding command will be described

25 in detail as follows. In the navigation terminal 10, in order

to input various types of information, which are required by the user, on the display section 11 under the control of the control section 13, a plurality of images are successively changed over in response to operation conducted by the user.

5   Examples of the types of information are traffic jam information on the road and traffic information including regulation information and accident information. Further examples of the types of information are weather information including the present weather in each region and weather

10   forecast and event information held in each region at present or in the future.

Information indicating the type of information inputted by the user and region information indicating a necessary region (for example, current position information, destination

15   information and position information indicating a position and region designated by the user) are outputted by the control section 13 to the data process section 15 and converted into a predetermined form in the data process section 15 and then sent to the information center 20 as an information demanding

20   command.

In the information center 20, according to the information demanding command acquired through the line for connecting the communication section 12 with the center communication section 21, the center control section 22 reads the detailed

25   information, which is identical with the type of information

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included in the information demanding command and also

identical with the region information, from the storage section

23. Thus read information is sent to the navigation terminal

10 via the above line.

5   In the navigation terminal 10, according to the detailed

information acquired by the communication section 12 via the

line, the detailed information is displayed on the display

section 11. At the same time, in the navigation terminal 10,

when the map display command is inputted by the user, according

10   to the map information acquired together with the detailed

information of the facility, a map, on which marks (a traffic

jam mark, traffic accident mark, weather mark and event mark)

based on the information are displayed being superimposed, is

displayed on the display section 11. In this connection, this

.15   detailed information is also stored by the temporary storage

section 17 provided in the control section 13.

Further, by utilizing the traffic information acquired as

described above, it is detected that an obstruction to running

such as a traffic jam or a traffic accident is caused on the

20   drive route.

In the navigation terminal that adopts the navigation

system in which various commands and various information are

sent and received via the line for connecting the communication

section 12 with the center communication section 21, operation

25   is conducted as follows. When the line for connecting the

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communication section 12 with the center communication section

21 is not established and the route calculation demanding

command is sent, first, the connection processing of the line

for connecting the communication section 12 with the center

5   communication section 21 is started. When the connection of

the line has been established thereafter, new information

indicating the current position of the vehicle is automatically

obtained from the measurement section 14 at this point of time.

This automatically obtained new information indicating the

10   current position of the vehicle is used as the starting point

information. This starting point information is sent together

with the destination information, the passing-through point

information and the route calculating condition information as

the route calculation demanding information.

15   For the reasons described above, a problem that a route

connecting a position where no vehicle actually exists with the

destination is calculated in the information center is not

caused.

[Example]

20   Next, referring to Fig. 2, an example according to the

above embodiment will be explained in detail.

Fig. 2 is a flow chart showing a process in which the

control section 13 provided in the navigation terminal 10

mounted on the vehicle establishes the line for connecting the

navigation terminal 10 with the information center 20 and sends the route calculation demanding command information.

First, in step S1, the starting point information, the destination information (together with the passing-through point information, if necessary) and the route calculating condition information, which are the route calculation demanding command information, are decided. This decision includes the following cases.

That is, the cases include a case in which the route is obtained for the first time. In this case, the user designates the starting point information, the destination information (together with the passing-through point information, if necessary) and the route calculating condition information for the first time. At this time, unless the user designates a specific position as the starting position, the information indicating the current position of the vehicle, which was measured by the measurement section 14 at a time of determining, is set to be the starting point information.

The cases also include a case in which the drive route information has already been acquired. In this case, when the vehicle deviates from the drive route or it is detected that an obstruct to running such as a traffic jam or a traffic accident on a road is caused, the route calculation demanding command is automatically sent. At this time, with regard to the destination information (together with the passing-through

point information, if necessary) and the route calculating

condition information, information, which was decided when the

route was acquired for the first time, is utilized as it is.

With regard to only the starting point information, the

5   information indicating the current position of the vehicle,

which has been newly obtained from the measurement section 14,

is utilized.

Successively, the processing of sending the route

calculation demanding command information is started (step

10   S2). It is judged whether or not the connection of the line

with the information center 20 has been completed (whether or

not the connection of the line has been established) (step S3).

When it is judged that the connection of the line has not

been completed (the line has not been established), the

15   processing of connection of the line with the information

center 20 is continued or newly started (step S4). Then, the

process returns to step S3, and it is again judged whether or

not the connection of the line has been completed (whether or

not the line has been established).

20   On the other hand, when it is judged that the connection

of the line has been completed in step S3 (the line has been

established), the information indicating the current position

of the vehicle is acquired from the measurement section 14. The

acquired information is made to be new starting point

25   information (step S5).

The route calculation demanding command information including this new starting point information is sent to the information center 20 via the line connected (step S6).

As described above, the new starting point information is sent to the information center 20 as the route calculation demanding command information. Accordingly, a problem that a route connecting a position where no vehicle actually exists with the destination is calculated in the information center is not caused.

In the above embodiment, in the case where the route calculation demanding command is automatically sent and the drive route information is acquired when the vehicle deviates from the drive route or when it is detected that an obstruction to running such as a traffic jam on a road or a traffic accident is caused, the destination information (together with the passing-through point information, if necessary) and the route calculating condition information are sent. However, each of the destination information (together with the passing-through point information, if necessary) and the route calculating condition information may be stored in the information center 20 together with the information for discriminating the navigation terminal when the information is sent to the information center 20 for the first time as the route calculation demanding command information. The stored information may be utilized when a new drive route is acquired.

With this construction, when a new drive route is

acquired, only the new starting point information is sent to

the information center 20 as the route calculation demanding

command information. Therefore, it is possible to reduce a

5   quantity of the information to be sent. Accordingly, it is

possible to reduce the time and cost necessary for

communication.

In the above embodiment, it is sure that the information

indicating the current position of the vehicle acquired from

10   the measurement section 14 is made to be the starting point

information after it is judged that the connection of the line

has been completed in step S3 (the line has been established).

However, the starting point information may be determined as

follows. A period of time that has passed until the connection

15   of the line is detected. According to the result of the

detection, for example, only when the line connection time is

longer than a predetermined period of time, the information

indicating the current position of the vehicle acquired from

the measurement section 14 is made to be the starting point

20   information. When the line connection time is shorter than the

predetermined period of time, a position of the vehicle, which

was input by the user as the starting point when the user gave

a direction so as to execute the route searching, may be

utilized as it is. Alternatively, a position of the vehicle

25   in the case of demanding a new route may be utilized as it is.

All the embodiments and examples are explained above when the present invention is applied to an apparatus mounted on a vehicle. However, it should be noted that the present invention can be applied to a cellular phone terminal, on which the
5   measurement section is mounted, and a system in which the terminal device is utilized.

For all the embodiments and examples explained above, it is possible to make computer programs, and the same function as that of the computer can be realized by the computer
10   programs.